PROGRESS OF THEORETICAL PHYSICS

Founded by H. Yukawa in 1946 Kyoto

Advisory Council

K. HUSIMI, *Nagoya*
M. KOBAYASI, *Kyoto*
M. KOTANI, *Tokyo*
R. KUBO, *Tokyo*
T. NAGAMIYA, *Osaka*
M. TAKETANI, *Tokyo*
S. TOMONAGA, *Tokyo*

Editor

H. YUKAWA, *Kyoto*

Volume 55

JULY—DECEMBER

1976

Published for the

Research Institute for Fundamental Physics

and

The Physical Society of Japan

Digitized by the Internet Archive
in 2024

https://archive.org/details/progress-of-theoretical-physics_1976_55_contents

CONTENTS

No. 1 July

Theory of Orbital Ordering. I ..... Eijiro Haga and Tsuyoshi Aisaka 1

Momentum Distribution of an Interacting Many-Boson System at High Density ..... Toshiyuki Nishiyama 16

A New Theory of Electronic State in Disordered System—*Generalization of Hubbard's Alloy-Analogy and the Gutzwiller Approximation*— ..... Tohru Ogawa, Taeko Ogawa and Takeo Matsubara 31

Variational Principle for Non-Equilibrium States and the Onsager-Machlup Formula ..... Hiroshi Hasegawa 44

Renormalization Group Equations in Critical Dynamics. II—*Binary Liquid, Superfluid Helium and Magnets*— ..... Jim D. Gunton and Kyozi Kawasaki 61

Scaling Theory of Non-Equilibrium Systems near the Instability Point. I—*General Aspects of Transient Phenomena*— ..... Masuo Suzuki 77

Spin Condition in the Cluster Variation Method and Its Application to the Neutron Matter ..... Hiroshi Mimura, Ichiro Homma and Masami Yamada 95

Structure Study of $T=0$ States in ^{16}O by $^{12}C+\alpha$ Cluster-Coupling Model. II ..... Yasuyuki Suzuki 111

An *a priori* Quantized Time-Dependent Hartree-Bogoliubov Theory—*A Generalization of the Schwinger Representation of Quasi-Spin to the Fermion-Pair Algebra*— ..... Masatoshi Yamamura and Seiya Nishiyama 124

Cluster Decomposition of the S Matrix and Density Expansion of Nuclear Phase Shifts ..... Mitsuaki Obu 135

Role of Final State Interactions in Y_0^* Production ..... C. P. Singh 151

Diffraction Dissociation and Non-Diffractive Production for Inelastic Scattering ..... Shigeo Minami 157

Analysis of the Decays $N^* \to \rho N$ in the Naive Quark Model ..... Morimitsu Tanimoto 164

Two Way Quark-Cascade and Particle Ratios in $\gamma + P \to h^{\pm}$ + Anything ..... Jiro Kodaira and Satoshi Matsuda 176

Structure Function for Parton-Proton Scattering ..... Minoru Hirayama and Tetsuji Kawabe 184

Heavy Lepton Production in e^+e^- Annihilation—*Global Properties and Decay Distributions*— ..... Noboru Kawamoto 196

Meson Masses in the Modified Han-Nambu Model ..... B. G. Kenny, D. C. Peaslee and L. J. Tassie 209

On the Pair-Annihilation of Quark and Antiquark ..... Ei-ichiro Kawai 216

New Representation of Gauge Operator and Off-Mass-Shell Dual Amplitude ..... Koichi Takahashi 231

Boson Field Description of Fermions in Two Dimensions ..... Azuma Tanaka and Kunio Yamamoto 241

The Form of Effective Potential ..... Reijiro Fukuda 258

The Problem of $P^+=0$ Mode in the Null-Plane Field Theory and Dirac's Method of Quantization ..... Toshihide Maskawa and Koichi Yamawaki 270

Quantization and Perturbation Theory of the Non-Abelian Gauge Theory Confined in the One-Dimensional Bag ..... Tamiaki Yoneya 284

The Kinematical Structure of Lightlike Wave Functions. II—*The Case of Baryons*— ..... Masakuni Ida and Haruichi Yabuki 297

Classical System of Nonlinear Dirac and Klein-Gordon Fields—*The Lowest Energy Kink*— ..... Antonio F. Rañada and Luis Vazquez 311

Letters to the Editor:

On Quadrupole Effects on Planetary Orbits ..... C. Hoenselaers 324

A Simple Composite Model Calculation for the Inelastic Structure Function ..... Masao Ninomiya and Keiji Watanabe 326

On Origin of Temporal Asymmetry in Steady State Far from Thermal Equilibrium. ..... Masahiro Agu 328

Crystal Structures and Pair Potentials ..... Takeshi Yoshida and Shiro Kamakura 330

Neutral Current Interactions Based on ν-ν Interactions ..... Takao Kaneko 332

Quark-Model Relations between ρ^0- and ϕ-Photoproductions ..... Masaki Hayashi 334
Fixed-Angle Scaling Form in Large Momentum Transfer Scattering ..... Takeo Matsuoka 336
Spontaneously Broken Scale Symmetry, Short-Range Gravity and the Cosmological Term ... . Christopher Gerry and Akira Inomata 338
Comment on the BNL Event $\nu_\mu p \to \mu^- \Lambda \pi^+ \pi^+ \pi^+ \pi^-$ ..... Mituaki Katuya and Yoshio Koide 340
A Canonical Transformation for the Sine-Gordon Equation .... Yuji Kodama and Miki Wadati 342
A Refinement of the Okubo-Gell-Mann Mass Relations ..... Shoji Sawada 344
Radiative Decays of the New Particle and Momentum Dependent Form Factors .... Kazuyoshi Izawa 345

Errata:

Self-Consistent Scaling Model for Multiplicity Distribution and Semi-Inclusive Missing Mass Spectra. II (Vol.55, p.1545) ..... Hisakazu Minakata 347

No. 2 August

Unrestricted Hartree-Fock Studies on the Electronic Structures of the Carbenes CH_2, CHF and CF_2 ..... Teruhiro Takabe, Mitsuo Takahashi and Hideo Fukutome 349
Deviations from Matthiessen's Rule in Electrical Resistivity of Nickel-Based Alloys .... Jiro Yamashita and Hiroko Hayakawa 361
A Microscopic Theory of the Interacting Bose System .... Shosuke Sasaki and Kiyohisa Matsuda 375
Stability of Metallic Hydrogens with Cubic Structure .... Hitose Nagara, Hiroshi Miyagi and Tuto Nakamura 396
Single Particle Aspects in a Collective Formalism for an Interacting Boson System .... Shuichiro Yamasaki, Takeji Kebukawa and Sigenobu Sunakawa 415
A Method of Determining the Orderings of the Ising Model with Several Neighbor Interactions under the Magnetic Field and Applications to Hexagonal Lattices .... Tomoshige Kudō and Shigetoshi Katsura 435
A Note on the Modified Cluster Expansion for Quantum System ..... Hiroaki Hara 450
Equations of Motion for Fluctuation and Variance in Nonequilibrium State .... Hiroshi Furukawa 464
Scaling Theory of Non-Equilibrium Systems near the Instability Point. II—*Anomalous Fluctuation Theorems in the Extensive Region*— ..... Masuo Suzuki 477
A Modified $1/d$ Expansion for Critical Temperature of Spherical Model on Hypercubic Lattice .... Ryuzo Abe 494
Kinetic and Hydrodynamic Scalings in an Exactly-Soluble Model for the Brownian Motion .... Terumitsu Morita and Hazime Mori 498
Isothermal Collapse of Rotating Gas Clouds .... Kiyoshi Nakazawa, Chushiro Hayashi and Mariko Takahara 515
Formation and Evolution of a High-Density Gaseous Disk in a Dense Stellar System .... Tetsuya Hara and Satoru Ikeuchi 531
An Episodic Accretion Model for Cosmic Gamma-Ray Bursts ..... Reiun Hōshi 542
Nonlinear Behavior of Nonspherical Perturbations of the Schwarzschild Metric .... Kenji Tomita and Nobuki Tajima 551
Cosmological Role of Weak Currents and a Quasar Model ..... Noboru Hokkyo 561
Rotation Aligned Coupling in the Angular Momentum Projection Method .... Akitsu Ikeda, Naoki Onishi and Raymond K. Sheline 570
The Generator Coordinate Method for Composite-Particle Scattering Based on the Kohn-Hulthén Variational Principle—*Application to* α-α, ^{16}O-α *and* ^{16}O-^{16}O *Scattering*— .... Yoshihide Mito and Masayasu Kamimura 583
Electron-Nucleus Non-Integrated Sum Rules and the Projection-Operator Method .... P. Quarati 599
A Phenomenology of the Semi-Inclusive Reaction in Proton-Proton Collisions .....

.....Shoichi Hori, Hideo Kawase and Masaki Shako 609
Crossing Invariant Solution of Baryon Exchange Degeneracy and Reggeon F/D Ratios in $SU(4)$ ..
.....Yasunori Miyata, Seiko Iwai and Koki Kudoh 619
Disconnected Quark Diagram in Decays of ψ .....Kansuke Ninomiya 627
The New Intermediate States in ψ' and J/ψ Decays .....Yasunari Tosa 634
A Gauge Model Based on Triplets .....Motohiko Yoshimura 641
Stringlike Object in Quantum Field Theory .....Yutaka Hosotani 655

Letters to the Editor:

Upper and Lower Bounds of WKB Eigenvalues .....Toshiyuki Arai 669
Irregular G_u-Parity Term in Non-Leptonic Weak Interactions .....Kunihiko Terasaki 671
Two-Jet Production Cross Section at Large p_T and Urbaryon Model .....Yuji Igarashi 673
An Explanation of Level Scheme of 1-Quasi-Particle-2-Phonon Multiplet in ^{93}Nb and ^{95}Tc by a Microscopic Quasi-Particle Cluster "Phonon" Coupling Model .....Masahiro Nakano 675
An Attractive Retarded Effect of OBEP on Nucleon-Nucleon Scattering .....
.....Toshio Obinata and Masanobu Wada 677
Turbulent State in Chemical Reactions .....Yoshiki Kuramoto and Tomoji Yamada 679
A Reduced Model Showing Chemical Turbulence .....
.....Tomoji Yamada and Yoshiki Kuramoto 681
Comments on Shielding Cut Mechanism of Arnold and Barnett Type .....
.....Haruo Fujisaki and Shigeharu Mutoh 683
Effects of Tensor Force in Localized Neutron System .....
.....Tatsuyuki Takatsuka, Kyuichiro Tamiya and Ryozo Tamagaki 685

No. 3 September

Unrestricted Hartree-Fock Studies on the Dimerization Reactions of the Carbenes CH_2, CHF and CF_2
.....Teruhiro Takabe and Hideo Fukutome 689
Synergetic Approach to the Phenomena of Mode-Locking in Nonlinear Systems .....
.....Yōji Aizawa 703
Metal-Insulator Transition Due to Electron Correlation .....Arisato Kawabata 717
Pattern Formation in Oscillatory Chemical Reactions .....
.....Yoshiki Kuramoto and Tomoji Yamada 724
The Ising Model on the Cactus Tree .....Takashi Tsuchiya 741
Reduction of Variables and Processes in Macrodynamics .....
.....Hirokazu Fujisaka and Hazime Mori 754
A Continuous Ising Model Exhibiting Phase Transitions of First or Second Order .....
.....Ken-ichi Nishikawa and Huzio Nakano 773
Eigenvalue Problem of Metastability in Macrosystem .....
.....Hiroyuki Tomita, Akira Itō and Hideyuki Kidachi 786
Anisotropic Spin One Ferromagnet in Callen's Approximation .....
.....Vijay Kumar and K. C. Sharma 801
Critical Dynamics of Planar Ferromagnet with a Small Basal Plane Anisotropy .....
.....Kyozi Kawasaki and Shinobu Hikami 808
Thermal Properties of Self-Gravitating Plane-Symmetric Configuration .....
.....Tetsuya Hara, Satoru Ikeuchi and Daiichiro Sugimoto 818
Mode-Mode Coupling Model for the Four-Body Correlations .....Munetake Hasegawa 830
In What Sense Does the "Phonon" Picture Persist in Spherical Even-Even Nuclei? .....
.....Saburo Iwasaki, Toshio Marumori, Fumihiko Sakata and Kenjiro Takada 846
Formation and Disintegration of High-Density Nuclear Matter in Heavy-Ion Collisions—*Nonrelativistic Approximation*— .....
.....Yasuhiro Kitazoe, Kazuo Matsuoka and Mitsuo Sano 860
Parity Nonconserving Nuclear Force in the Process $n+p \rightarrow d+\gamma$ .....
.....Katsuhiko Ohya, Takamitsu Oka and Yu-ichi Yamamoto 875
Meson-Baryon and Baryon-Antibaryon Ratios in Two Way Quark-Cascade Model .....

Jiro Kodaira and Satoshi Matsuda 888
Eikonal Approximation-Backward and Transverse Effects ..... Takayuki Matsuki 897
Exact Solutions of the Spinor-Spinor Bethe-Salpeter Equation and Their Gauge Dependence .....
Akitoshi Nishimura and Kiyoshi Higashijima 908
Asymptotic Behavior of the Eigenvalues in the Wick-Cutkosky Model for Large Principal Quantum Number ..... Noriaki Setô 919
Extended Particle and Renormalization of Fluctuation .....
Masataka Hosoda, Hiroshi Kozakai and Tadayoshi Shimizu 926
An Extended Hadron Model Based on the Exact Solution of the Nonlinear Field Equation .....
Tadashi Uchiyama 938
Quantum Corrections in Superconductor Models ..... Keiji Kikkawa 947
Muon as a Resonance ..... Hideji Kita 956
Vector Field with a Bare Mass and the Higgs Mechanism .....
Masahiko Konoue and Noboru Nakanishi 972

Letters to the Editor:

Quark Confinement with a Regular Cutoff ..... Izumi Ojima 981
A Comment on p-Orbital Bands and Crystal Structure .....
Tohru Ogawa and Takeo Matsubara 984
Pion-Nucleus Charge-Exchange Reaction .....
Hidetoshi Nishimura and Kuniharu Kubodera 986
Drell-Yan Mechanism in Hadronic J/ψ Production ..... Hiromasa Komatsu 988
Critical Temperature of n-Vector Model near Two-Dimensions ..... Shinobu Hikami 990
The (3,3) Resonance and the Diffractive Nature of the Pion Nucleus Scattering .....
Kenji Sakai and Masaru Yasuno 991
On Consistency between Okubo-Type Mass Formula and Experimental Result of DORIS ....
Keijiro Honda, Kenzo Iwata and Toshiyuki Murota 994
Critical Velocity of Superfluid Helium Films ..... Yasumaru Ichikawa and Tunemaru Usui 996
Color-Octet Component of Weak Current and a Lepton-Hadron Correspondence .....
Kazuo Koike 998
Dynamical Scaling in Inclusive Reactions ..... Taizo Muta 1000
On the Non-Plateau Behaviour of One-Particle Inclusive Spectra in Central Regions. Hujio Noda 1002
On the Effective $\lambda\pi\gamma$ and $\lambda\pi Z$ Vertices in a Vector-Like Model .....
Kenzo Inoue and Akira Kakuto 1004
Quantum Crossover Effect in the Gas-Liquid Phase Transition ..... Masuo Suzuki 1007

Errata:

Neutral Current Interactions Based on ν-ν Interactions (Vol.56, p.332)..... Takao Kaneko 1009

No. 4 October

One-Dimensional Anisotropic Exchange-Coupled Chain with $S=1/2$ .....
Yoshihiro Tsuchida, Akihide Oguchi and Koichi Kanai 1011
New Self-Consistent Approach to Spin Dynamics at High Temperatures .....
Naruichi Nagao and Tuto Nakamura 1021
Phase Transitions in Assemblies of Many Identical Thermodynamical Systems .....
Mamoru Yamashita and Huzio Nakano 1042
Volume-Dependent Cluster Sums for Lattice Gases. III—*Patterns of Seven or Eight Particles and Expressions for the Cluster Sums*— .....Kazuyosi Ikeda and Kunisuke Nisizima 1056
Statistical-Mechanical Theory of the Boltzmann Equation and Fluctuations in μ Space .....
Michio Tokuyama and Hazime Mori 1073
Dynamical Collapse of the Intracluster Gas and the Formation of a Hot Plasma in Clusters of Galaxies .
Fumio Takahara, Satoru Ikeuchi, Noriaki Shibazaki and Reiun Hōshi 1093
Energy Flow in Cascade Showers .....Shoji Dake and Hiroshi Oda 1104
The Formation of Molecules in Contracting Interstellar Clouds .....Hiroko Suzuki, Satoshi Miki, Katsuhiko Sato, Masayoshi Kiguchi and Yoshitsugu Nakagawa 1111

Admixtures of Shell and Cluster States in ^{18}F ..... Toshimi Sakuda, Sinobu Nagata and Fumiki Nemoto 1126
Structure of the Anomalous $0^{+\prime}$ Excited States in Spherical Even-Even Nuclei with N or $Z \approx 40$ ..... Saburo Iwasaki, Toshio Marumori, Fumihiko Sakata and Kenjiro Takada 1140
Interplay of Pairing and Intrinsic Modes of Excitation in Nuclei. I.—*Transcription of Nucleon System into Ideal Boson-Quasi-Particle Space*— ..... Tōru Suzuki and Kenichi Matsuyanagi 1156
Another Formalism to Include the Coulomb Interaction in Particle-Nucleus Scattering ..... Kouichi Nakano 1174
Absorbed Two-Component Model for Low Mass $N\pi$ System Produced in Diffraction Dissociation ..... Masayuki Uehara 1183
Low-Energy Pomeron ..... Tsutomu Yanagida and Minoru Yonezawa 1199
Asymptotic Parametrization of πp Forward Symmetric Amplitude by Continuous-Moment Sum Rules ..... Tadashi Miyakoshi 1204
Test of Scaling and the Multiperipheral Model for Low Multiplicity Events at Cosmic Ray Energies ..... R. K. Shivpuri, S. K. Jha and Tara Chand 1211
Coherent State Representation of Multiparticle Final States and Shadow Scattering at Very High Energies ..... Hisakazu Minakata 1217
On Fireball Model and Ultrahigh Energy Cosmic γ Ray Spectrum by p-p Collisions Fu-Shong Kuo 1234
Composite Structure of Hadrons and One-Particle Distribution Function ..... Hujio Noda 1245
A Multi-Regge Model with the Threshold Factor for Cluster Production—*Two-Component Analysis of Multiplicity Distributions in p-p Collisions at 50-400 GeV/c*— ..... Hitoshi Ito, Koushy Sasaki, Fujio Tanaka and Takeshi Togawa 1258
Charge Symmetry Violations in the GIM Model ..... Gordon J. Aubrecht II and M. S. K. Razmi 1269
The Second Class Current and Structure of Elementary Particles ..... Hirofumi Senju and Takeo Matsushima 1280
A Physical Picture of String-Interaction in Tachyon-Reggeon Scattering ..... Tomoya Akiba 1287
Singular Lagrangian and the Dirac-Faddeev Method —*Existence Theorems of Constraints in 'Standard Form'*— ..... Toshihide Maskawa and Hideo Nakajima 1295
Geometry, Gravity and Dual Strings ..... Tamiaki Yoneya 1310
An Operator Formalism to the Path Integral Method ..... Tetsuo Goto and Sigefumi Naka 1318

Letters to the Editor:

Slopes of Regge Trajectories Based on the Vortex-Line Models ..... Yoshio Miyatake 1336
Particle Correlations in an Independent Emission Model ..... Keizo Kobayakawa and Toshiyuki Morii 1338
π^0-Condensation Resulting from Alternating-Layer-Spin Structure in Dense Neutron Matter ..... Ryozo Tamagaki and Tatsuyuki Takatsuka 1340
Volume-Dependent Cluster Sums for Lattice Gases. IV—*Behaviour of the Cluster Sums*— ..... Kunisuke Nisizima and Kazuyosi Ikeda 1343
Application of Forward Dispersion Relation to Kaon Carbon Scattering ..... Kiyoshi Arai, Ichita Endo and Masayoshi Kikugawa 1345
Are Violations of Feynman and Bjorken Scaling Mutually Connected? ..... Hisakazu Minakata 1348

Errata:

Comments on Shielding Cut Mechanism of Arnold and Barnett Type (Vol.56, p.683) ..... Haruo Fujisaki and Shigeharu Mutoh 1350

No. 5 November

Hydrodynamical Behavior of Bose-Einstein Condensate near the Lambda Point ..... Yukio Okwamoto 1351
Theory of the Relaxation Time of the Bose-Einstein Condensate ..... Nobuharu Morii, Kazumasa Miyake and Tunemaru Usui 1360
High-Frequency Expansion of Memory Function in Classical Simple Liquids. III—*Liquid*

Metals— ..... Fukuo Yoshida 1374
The Inadequacy of the Impulse Approximation for a Hard Core Potential ..... Hichang Kang 1383
Correlated Disorder in One-Dimensional Ising System at Zero Temperature ..... Mariko Nagase, Tuto Nakamura and Jun-ichi Igarashi 1396
Nonlinear Stochastic Differential Equations in Statistical Physics and Integral Representation ..... Hiroshi Nakazawa 1411
An Ising Model for an Annealed Magnetic Mixture with Continuous Distribution of Random Bonds ..... Yasuhiro Kasai and Itiro Shozi 1434
Approximate Method for the Free Energy ..... Akihide Oguchi 1442
Relationship between d-Dimensional Quantal Spin Systems and $(d+1)$-Dimensional Ising System—*Equivalence, Critical Exponents and Systematic Approximants of the Partition Function and Spin Correlations*– ..... Masuo Suzuki 1454
Radio Luminosity versus Volume Emissivity Diagram of Galaxies in the Virgo Cluster ..Ko Aizu 1470
Hydrostatic Structure of a Hot Plasma in a Cluster of Galaxies ..... Noriaki Shibazaki, Reiun Hōshi, Fumio Takahara and Satoru Ikeuchi 1475
On the Gas Motion in Close Binary Systems ..... Sǿren-Aksel Sǿrensen 1484
Hartree-Fock Charge Distribution for 1p-Shell Nuclei ..... R. S. Bhalerao and A. T. Dhavale 1497
A Study on Three-Alpha Structure of ^{12}C in the Faddeev Formalism ..... Yoshikazu Fujiwara and Ryozo Tamagaki 1503
Potential Scattering in Three Dimension—*Backscattering and Fresnel Effects*— ..... Takaomi Ishihara 1521
Multiplicity Distributions in Impact Parameter Space ..... Masami Wakano 1535
Model of Cluster Formation in Multiparticle Production Processes ..... Akira Niégawa 1550
Structure of Symmetry Breaking in Hadronic Reactions ..Takeo Matsuoka and Tadashi Nishitani 1560
Trajectory Mixing Scheme for η and η' Mesons ..... Takeo Inami, Ken Kawarabayashi and Shinsaku Kitakado 1570
Higher Order Effects as a Test of Gauge Models with $V+A$ Currents ..... Kazuo Kiriyama, Shoichi Midorikawa and Motohiko Yoshimura 1586
Parton Model with Anomalous Dimension ..... Tsuneo Uematsu 1599
Possible Extensions of the Unified Model for Fundamental Particles ..... Takao Kaneko 1609
Canonical Quantization of Non-Abelian Gauge Field. II. ..... Jiro Sakamoto and Masa-aki Sato 1617
Hyperquantization of Multi-Mass Fields ..... Hira Lall Baisya 1625
Quantum Field Theory of Extended Particles ..... Katsuya Hasebe 1637
Bilinear Spinor Representation of Space-Time ..... Nguyen Thi Hong 1647

Letters to the Editor:

ψ Production and Quark Energy Distribution in Hadrons ..... Ei-ichiro Kawai, Takao Koikawa, Masahisa Matsuda, Morimitsu Tanimoto and Seiichi Wakaizumi 1654
Large Momentum Transfer Behavior in Two-Body Scattering and One-Dimensional Structure of Hadrons in Urbaryon Model ..... Fumihiko Nakamura 1657
$SU(4)$ Symmetry and Deep Inelastic Processes ..... Takao Kawaguchi, Ken-ichi Konishi and Hisao Nakkagawa 1659
Similarity Law in Spinodal Decomposition ..... Hiroyuki Tomita 1661
Quark-Lepton Interaction and $\bar{e}$-e ($\bar{p}$-p) Annihilation ..... Masao Inose, Hideki Kamo and Shigeo Minami 1663
Global Stability of the Uniformly Rotating Gaseous Disks ..... Fumio Takahara 1665

Errata:

Volume-Dependent Cluster Sums for Lattice Gases. III—*Patterns of Seven or Eight Particles and Expressions for the Cluster Sums*— (Vol.56, p.1056) ..... Kazuyosi Ikeda and Kunisuke Nisizima 1668

No. 6 December

One-Dimensional Random Annealed Ising Spin System on the Site Model ..... Shunichi Muto and Takehiko Oguchi 1669

The Thomas-Kuhn Sum Rule and Superfluidity. I —*Applicability of Linear Response Theory to Macroscopic Systems*— ..... Takeo Izuyama 1674
Dynamics of Bose-Einstein Condensate and Two-Fluid Hydrodynamics ..... Kazumasa Miyake and Kazuo Yamada 1689
Renormalization Group Equations in Critical Dynamics. III —*Scaling Far from Equilibrium*— ..... Kyozi Kawasaki 1705
Formation and Interaction of Sonic-Langmuir Solitons—*Inverse Scattering Method*— ..... Nobuo Yajima and Masayuki Oikawa 1719
Theory of Canonical Transformations for Nonlinear Evolution Equations ..... Yuji Kodama and Miki Wadati 1740
The Gas Drag Effect on the Elliptic Motion of a Solid Body in the Primordial Solar Nebula ..... Isao Adachi, Chushiro Hayashi and Kiyoshi Nakazawa 1756
Binary Star Model for Recurrent *X*-Ray Bursts ..... Reiun Hōshi 1772
Screening Effect on Electron Captures at High Densities ..... Koichi Yokoi and Masami Yamada 1781
A Semi-Microscopic Derivation of Coupling between Rotational and Intrinsic Motions. I ..... Atsushi Kuriyama 1786
Pion Condensation. I —*Nonrelativistic Treatment for π^- Condensation*— ..... Takashi Kanai 1802
A Method of Solution to Muskhelishvili-Omnes Equation in Final-State Interaction Model ..... Yoshihiko Iwamura 1812
A ΣN Bound State and the $K^- d \to \Lambda p \pi^-$ Reaction ..... Shijong Ryang and Takesi Saito 1826
Transition Feature between Large and Small Momentum Transfer Regions ..... Masahiro Imachi 1832
Study of Multiple Meson Production at Cosmic Ray Energy. I —*Longitudinal Behaviour of Gamma-Ray Air Family*— ..... Eiichi Konishi, Toru Shibata, Edison H. Shibuya and Nobuhito Tateyama 1845
Approximate Derivation of the Lateral Structure Function of Electrons in a Cascade Shower ..... Hiroshi Oda 1863
Unified Model for Elastic Scattering and Inclusive Reactions ..... Masaru Doi 1872
Constituent Quarks as Clusters in Quark-Gluon-Parton Model ..... Takeshi Kanki 1885
An Improved Mass Formula for 0^--Mesons in Broken $SU(4)$-Model for New Particles ..... Ziro Maki, Tadayuki Teshima and Isao Umemura 1902
Strong and Radiative Decays of ψ and Related Particles in the $SU(3)' \times SU(3)''$ Scheme of the Three-Triplet Model ..... Yoshimasa Somekawa and S. Y. Tsai 1910
On the Heavy Leptons as Hadron Constituents ..... Sho Tanaka 1922
What are the Gauge Bosons Made of? ..... Hidezumi Terazawa, Keiichi Akama and Yūichi Chikashige 1935
μ-e Universality and the Spontaneous μ-e Mass Splitting ..... Kiyoshi Higashijima and Ryu Sasaki 1939
Fermi-Bose Similarity ..... Minoru Omote, Yoshio Ohnuki and Susumu Kamefuchi 1948

Letters to the Editor:

How Do Colored-Hadrons Appear in Neutrino Production? —*On the Anomaly*— ..... Kazuo Koike 1965
Comments on Geometrical Features of the Shielded Fixed Pole Pomeron at Very High Energies. II ..... Haruo Fujisaki and Kanenobu Tsukahara 1967
Soliton Creation-Annihilation Operators as the Canonical Transformation ..... Shogo Aoyama and Yuji Kodama 1970
On the Exact Solutions of the Nonlinear Electrodynamic Equations ..... Reva Garg 1972
Rich Yield of High Momentum Hadrons by Two-Fireball Model in $e\bar{e}$ Annihilation ..... Kazuo Ghoroku, Yasuo Myozyo, Hiroyuki Nagai and Kunio Shiga 1973
Linear Classical Spin Chain with Nearest, Next-Nearest Neighbor and Spin-Lattice Interactions ..... Akihide Oguchi and Yoshihiro Tsuchida 1976
Longitudinal Polarizations of Emitted Neutron in Muon Capture on ^{40}Ca ..... Noboru Ohtsuka, Kenji Kume and Hisao Ohtsubo 1978

On the Magnetic Dipole Excitation Due to Inelastic Electron Scattering ..... Saburo Fujii and Masanori Hatchya 1980

Author Index to Volume 56 1983
Subject Index to Volume 56 1990
Contents to Volume 56 i

CONTENTS OF THE NEXT ISSUE

Progress of Theoretical Physics **Vol. 57, No. 1 January 1977**

Orbital Dynamics of Anisotropic Superfluid ..... Masakatsu Ishikawa

Use of a Coherent-State Representation for a Many-Boson System at High Density ..... Masakazu Tsujii and Toshiyuki Nishiyama

Thermodynamic Properties of the Frozen System ——*Linear Ising Mixture of the "Site Model"*—— .. Yoshimasa Itoh and Kiyoshi Teramoto

The Thomas-Kuhn Sum Rule and Superfluidity. II ——*Conditions for Superfluidity*—— ..... Takeo Izuyama

Thermodynamic Limit in Quantum Stochastic Process .... Hidemi Ito and Teruaki Nakagomi

Propagators for a Scalar Field in Some Bianchi-Type I Universe .. .. Hidekazu Nariai

Backward Angle Anomaly in Alpha+^{16}O Scattering and Alpha-Cluster States in ^{20}Ne .... Shigeo Ohkubo, Yosio Kondō and Sinobu Nagata

Derivation of Random Phase Approximation on the Basis of the Generalized Schwinger Representation of the Fermion-Pairs .. .. Yutaka Mizobuchi, Seiya Nishiyama and Masatoshi Yamamura

A Microscopic Theory of Large Amplitude Nuclear Collective Motion ..... Toshio Marumori

Semi-Microscopic Derivation of Coupling between Rotational and Intrinsic Motions. II ..... Atsushi Kuriyama

Single Pion Production in Proton-Deuteron Collisions .. Tsuneyuki Hiramoto

Study of Multiple Meson Production at Cosmic Ray Energy. II ——*Analytical Derivation of Lateral Structure Function of Gamma-Ray Air Family*—— .... Eiichi Konishi, Toru Shibata and Nobuhito Tateyama

Fire Ball Model Analyses of Small and Large Transverse Momentum Pion Distributions at ISR Energies .... Mitsuru Hama, Masayuki Nagasaki and Haruo Suzuki

Role of the Nucleon Exchange in the Diffraction Dissociation $N\pi \to \pi(N\pi)$ ..... Akira Minaka, Hiroyuki Sumiyoshi and Masayuki Uehara

***t*- and *u*-Channel Structure of Non-Resonant π-N Scattering Amplitudes at Low Energies** ..... Tsutomu Yanagida

Short Distance Regge Singularities——*Potential Models*—— .... Reinhard Oehme

Large Transverse Momentum Processes and a Hard Scattering Model of Urbaryons with Two-Jet Structure ..... Yuji Igarashi

"Minimal Boosting" of $SU(6)$ Scheme .... Shin Ishida, Azusa Matsuda and Mikio Namiki

Spontaneously Broken $SU(2)$ Gauge Invariance and the $\Delta I=1/2$ Rule ..... Okiyasu Shito
Vectorlike $SU(3)\times U(1)$ Gauge Model ..... Motohiko Yoshimura
Weak and Electromagnetic Interactions in Superconductivity Model ..... Takesi Saito and Kazuyasu Shigemoto
Pattern of Scaling Violation in Covariant Parton Model and Openings of New Channels ..... Tetsuji Kawabe
Dispersion Approach to Renormalization Group Equations ..... Kazuhiko Nishijima and Ryu Sasaki
Free Massless Scalar Field in Two-Dimensional Space-Time ..... Noboru Nakanishi
Finite and Covariant Formulation of Local Field Theory Based on Improved Operator Products ..... Yukio Taguchi, Azuma Tanaka and Kunio Yamamoto
On the Pole-Search Problem of Scattering Amplitude in L^2 Norm ..... Akira Kanazawa and Tadashi Miyakoshi
Spacetime Structure Explored by Elementary Particles: Microscopic Origin for the Riemann-Cartan Geometry ..... Kenji Hayashi and Takeshi Shirafuji
Derivation of Relativistic Wave Equations in the Theory of Elementary Domains ..... Kunio Yasue

Letters to the Editor:

Lagrangian Theory of Relativistic Rotator ..... T. Takabayasi
Relativistic Mechanics of Bilocal and Trilocal Structures ..... T. Takabayasi
On the Equation of Motion for Fluctuation in Nonequilibrium State ..... H. Furukawa
p-p Phase Shifts at 2 GeV/c ..... N. Hoshizaki and T. Kadota
On the Structures of the Quarks and the Quark-Systems in the Hadrons ..... T. Narita
Trouser-Type Universe Metric ..... H. Ishikawa
Stability of Vacuum in the Curved Space-Time of Relativistic Star ..... H. Sato
On Approximate Solution of Bethe-Salpeter Equation in the Quark-Gluon Model ..R. Hayashi

INSTRUCTIONS TO CONTRIBUTORS

General. Manuscripts should be typewritten (in **pica** size), double spaced, with margins of 2 cm on both sides, on standard A4 size white paper (21 cm×30 cm). **Two copies,** the original and one duplicate copy, must be submitted to the editorial office while a third copy should be kept by the author.

The number of pages of a manuscript should not exceed, in principle, a maximum of thirty in standard size (average 25 lines in length per page) including figures. (One figure is counted as 1/2 page; one simple picture for illustrations is counted as 1/4. If a figure is composed of several parts such as (a), (b), ..., each part is counted likewise.) In the exceptional case that the number of manuscript pages unavoidably exceed 30, the manuscripts will be published only if it is judged specially significant by the editorial committee on the basis of referees' opinions. In no case may the number of pages exceed 45. In this case the publication may be somewhat deferred.

The text must consist of an abstract, the body of the paper (including tables and figure captions) and references. Any recent issue of this journal may be referred to for examples of general style, arrangement, abbreviations, etc.

The prime requisite is that the copy shall be clear to typesetter, who is neither a physicist nor a mathematician.

Alterations in the text should be avoided once the paper is set in type. Authors will be charged for excessive corrections.

Abstract. An abstract should be confined to one page of manuscript; it must indicate the scope of the research and principal findings.

References. References should be numbered consecutively in the order of their appearance and listed after the text. Each citation should be referred to in the text by the key number. The form of the citations should conform to those used in this journal.

Citations from sources other than journals or books are to be referred to in footnotes.

Mathematical expression. It is desirable to type all mathematical and chemical symbols, equations and formulas, leaving enough space above and below for printer's marks. If these should have to be handwritten for any reason, print them clearly and carefully. Be sure to distinguish between capital and small letters. Identify in the margin Greek letters and unusual symbols. Superscripts and subscripts should be placed carefully, using inverted carets and carets, respectively. Complicated usage of both superscript and subscript must be avoided. Use the solidus (/) for fractions in order to save vertical space and to facilitate typesetting at the same time. Avoid repetition of a complicated expression by representing it by some convenient symbol.

Tables. Tables should be typed on separate sheets and numbered in roman numerals. Avoid complicated column headings.

Figures. Authors are cautioned that all figures must be submitted in a form ready for reproduction, on sheets separate from the running text. Drawings should be carefully made using India ink on white paper and all lines should be of sufficient thickness to reproduce well. The author's name and figure numbers should appear on the lower right-hand part of the page. Figure caption should be collected on separate sheets at the end of the manuscript.

Letters to the Editor. A letter must be shorter than 120 lines of 17 cm length typewritten in *pica* size. This must include the spaces for mathematical expressions, figures and tables.

i) A mathematical expression typewritten in one line must be counted as two lines of text. The one containing fractions is to be counted as three lines.

ii) In printing, all figures are contracted to one-column (6 cm) or two-columns (12 cm) in width. With the height h (in cm) reduced this way, the space of the figure is counted as (3/2) h (or twice that if 12 cm is used) lines of typed text.

Publication charges. The author's institution is requested to pay a publication charge of 4,000 yen per page. This also applies to a Letter to the Editor.

Reprints. Authors are entitled to receive 100 reprints free of charge. Additional reprints, a multiple of 50, can be obtained at 8 yen per page.

理論物理学の進歩　第56巻　第6号（昭和51年12月号）

編集代表者
発行人　湯川秀樹
京都市左京区北白川追分町
京都大学湯川記念館内

印刷所　日本写真印刷株式会社
京都市中京区壬生花井町3
鈴木正三

発行所　理論物理学刊行会
606 京都市左京区北白川追分町　京都大学湯川記念館内
電話(751)2111—内線 7051・振替貯金口座　京都3977番

昭和51年12月20日印刷・12月25日発行・定価 ¥2,500(年間 ¥30,000)

© Publication Office, Progress of Theoretical Physics 1976

Publication of this journal is partially supported by the Grant-in-Aid for Scientific Research from the Ministry of Education.